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A Free and Open-Source Solution to Standardize and Automate the Creation of Setup Fields in Radiation Therapy Planning

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INTRODUCTION

- Modern image-guided radiation therapy requires precise, site-specific imaging setup fields that account for patient orientation and treatment technique
- Manual field creation is error-prone with traditional templates either overloading clinicians with excessive fields or lack sustainability, leading to variability and safety risks
- A standardized, automated approach is essential to ensure consistency, reduce errors, and streamline planning workflows

AIM

Develop a streamlined, automated tool for Eclipse TPS that generates patient-specific setup fields based on patient orientation, treatment site, physician, and planner parameters.

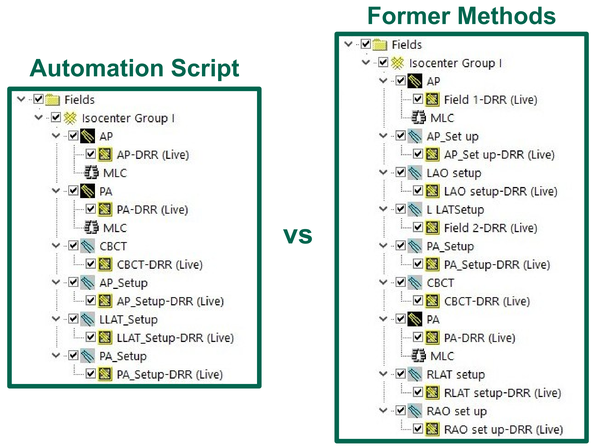
METHOD

- Queried Eclipse database to map existing setup fields across treatment sites and orientations
  - Refined via multidisciplinary input (therapists, dosimetrists, physicists, and physicians)
- Built a keyed mapping file that dictates field assignments per treatment site and orientation
  - Easy updates without code changes
- Developed a C# script using the Eclipse Scripting API to automatically add required setup fields based on patient orientation, treatment site, physician, and planner parameters
- Encouraged hotkey binding for rapid execution
- Validated with internal code review and end-to-end testing on research system before clinical deployment

RESULTS

- Script completes field generation in less than 5 seconds on the clinical system
  - Enabling seamless planner workflows
- Configuration file supports easy modification for evolving clinical standards and institution-specific preferences without code revisions
- Successfully deployed and actively used across treatment planning workflows
  - Eliminates manual setup field creation and removes template-related clutter
- Trivial installation process enables rapid rollout to new clinics
  - Eclipse TPS hotkey integration ensures immediate planner adoption
- Reduces missed and undelivered fields through a more intentionally organized field ordering
- Enforces consistent naming conventions
- Reduces physician plan review complexity by removing unnecessary template fields

Figure 2 – Screenshots from Eclipse TPS comparing field listings with the automation script and from previous methods



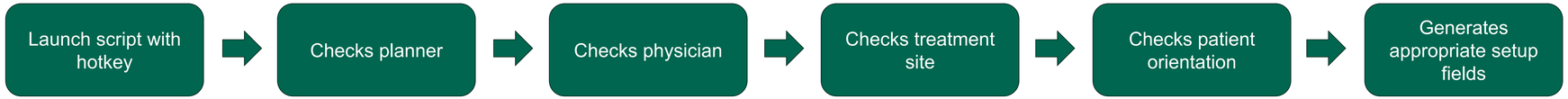


Figure 1 – Flow chart outlining script execution processes. Each check along the process is established within the configuration file and entirely customizable. Total execution time is less than five seconds.

CONCLUSIONS

- Automating setup field creation standardizes planning, reduces manual workload, and minimizes safety risks associated with inconsistent field selection
- The tool promotes a cleaner, more efficient workspace and improves dosimetrist workflow while maintain rigorous clinical validation standards
- This projects demonstrates that simple, API-driven automation can significantly enhance radiation therapy treatment planning accuracy, reproducibility, and operational efficiency

FREE AND OPEN-SOURCE

- The complete C# script, configuration file template, and documentation will be publicly released under a permissive open-source license following publication
- Encourages radiation oncology centers to adopt, customize, and contribute improvements tailored to their institutional protocols
- Ready-to-deploy package includes setup guides and instructions for immediate clinical integration

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